Remarks

Reconsideration of the application as hereby amended is respectfully requested.

The Examiner's rejection of claims 15-37 under 35 USC § 102 and § 103 is respectfully traversed for the following reasons.

It is noted that in the Rejections set forth in the Detailed Action the interpretation of the claim limitations is not consistent with the established claim interpretation practice, as set forth in MPEP 2111, according to which :

-During patent examination the pending claims must be "given the broadest reasonable interpretation consistent with the specification". In re Prater, 415 F.2d 1383, 1404-05, 162 USPQ 541, 550 –51 (CCPA 1969).

and

-The broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. In re Cortright 163 F. 3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999).

In particular, it is noted that the claim terms *"foundation soil"* , *"bearing capacity"* , *" deep in the foundation soil"* and *"monitoring...to detect the moment...which is the moment when the compaction..."*, were deemed as identically disclosed by Haekkinen and "Modulo" following to an interpretation thereof made in isolation from the disclosures of the specification and differently from the interpretation which the person skilled in the art would have given them. Note the evidence submitted with the applicant's previous submissions, such as "CBD-148-Foundation Movements".

Further evidence as to the proper interpretation of such terms in the pertinent art is herewith enclosed as excerpts from:

- the "Department of the Army U.S. Army Corps of Engineers"
(available on the Internet –www.usace.army.mil/publications/eng-manuals) and
-the Geology Glossary of the Design & Construction Standards
(available on the Internet
www.dot.state.ak.us/stwddes/dcs/assets/docs/geotechman/apdx_b.pdf) .

It is also submitted that the teachings of Haekkinen and, implicitly, of the corresponding disclosure "Modulo" along with their significance in the art, are already mentioned and discussed in the preamble of the specification of the application.

Therefore, on proper interpretation of the claim terms, it is readily apparent that :

a) The references cited (1) Haekkinen and (2) Modulo, no. 206, fail in fact to disclose *"each and every element as set forth in the claim, either expressly or inherently"*, Verdegaal Bros. V. Union Oil Co. Of California 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987);

and

b) The cited references (1) and (2) fail to meet the disclosure criteria that, "the *identical invention must be shown in as complete detail as is contained… in the claim*", Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989);

since main claims 15, 30 and 33 (and also 36 and 37), comprise at least the features not disclosed by Haekkinen:

(see for comparison the corresponding features disclosed by Haekkinen closed in parentheses which follow to each feature cited)

A method

(a) for increasing the bearing capacity of foundation soils for built structures,

(Haekinnen teaches a *method for levelling sunken or broken earth supported floors or slabs*)

(b) providing a plurality of holes spaced from each other ***deep in the foundation*** *soil;*

(Haekinnen teaches *drilling at least one hole 1 through the floor or slab 2 at the sunken or broken portion 2A...to the interface between the soil 3 and the floor or slab*)

c) injecting into the foundation soil, through said holes, a substance which expands as a consequence of a chemical reaction;

(Haekinnen teaches *injecting the unexpanded mixture beneath the sunken or broken portion of earth-supported floor or slab*)

d) producing compaction of the foundation soil contiguous to the injection zone due to the expansion of said substance injected into the soil;

(Haekinnen never teaches a soil compaction whatsoever, let alone a foundation soil compaction)

e) constantly monitoring level variations of the soil and/or built structures overlying the injection zone to detect the moment when the built structures and/or the soil surface, overlying said injection zone, begins to raise which is the moment in which the compaction of the soil has reached levels generally higher than a required minimum value at which the soil lying below and around said injection zone withstands and rejects dynamic and static weights exerted thereon by said

built structures and by overlying and adjacent soil masses,

(Haekinnen teaches *measuring the elevation of the sunken or broken portion following expansion to monitor the return to a position level with the remainder of the floor*)

f) the expansion of the injected substance is very fast with a potential increase in volume of the expanded substance being at least five times the volume of the substance before expansion.

(Haekinnen never teaches which is the potential increase in volume of the substance- Note also that the expandable substance given as example in the specification of the application is different from that of Haekkinen).

In the applicant's view, such objective facts fully justify a reconsideration of the rejection of claims 15-35, pending in the application, and an allowance thereof.

As regards the document (2) "Modulo", no. 206, it is submitted, as is clearly apparent from the whole text and figure and from the reference made to the "system imported from Finland", that such disclosure is a report made by the applicant in a magazine disclosing exact application of the leveling method of Haekkinen. The disclosure only regards the same lifting/leveling method carried out *by filling up, with injected resin, voids between the ground and the subsided structure.* A *laser level control* is disclosed *to achieve a high accuracy of the lifting.* A compaction of the soil under the void filled by injection may occur as a reflection of the weight of the structure (slab, floor) lifted by the injection.

Thus "reinforcing the area", as disclosed by the prior document is clearly, for the person with ordinary skills, a feature not identical to "increasing the bearing capacity of the foundation soil" by injections "deep into the foundation soil".

Accordingly, the same observations as for Haekinnen, above apply.

In relation with the rejection of claim 30, in particular with regard to the alleged inherent disclosure of the feature *...tree-like shapes...*, the following is submitted.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic . *In re. Rijckaert, 9.*

and

To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and it that it weould be so recognized by persons of ordinary skill. *USPQ 323, 326 (CCPA 1981).*

(See MPEP 2112)

Note, in this respect that in claim 30 that the injection of the expandable substance is made *along rising columns in holes deep in the foundation soils*, and that the *tree-like shapes form along said columns.*

In contrast, Haekkinen teaches injecting resin *under sunken or broken portions in voids which raises the portions toward a position level.*

It is thus unambiguously derivable for the person of ordinary skill that only a pillow mass of expanded substance will form (see the figures of Haekkinen and Modulo) which will fill up the void and lift the floor or slab.

Neither a rising column nor tree-like shapes formed along such column are disclosed in the cited documents.

In view of lack of disclosure, in Haekkinen and Modulo, identical to what is claimed in the rejected main claims, as set forth above, also the rejections of the dependent claims and the claim rejections based on 35 USC § 103 (par 5 –7 of the Detailed Action) appear improper.

Accordingly, it is respectfully requested that the objective facts and evidence

herein submitted be thoroughly assessed by the Examiner and the claim rejections be withdrawn.

Favourable action is respectfully solicited.

Official

FAX RECEIVED

NOV 0 7 2002

GROUP 3600

Respectfully submitted,

Daniel O'BYRNE
(Reg. No. 36,625)
Agent for the Applicant
Via Meravigli 16
20123 MILAN-ITALY
Tel. 39.02.8590-7777

Milan: November 7, 2002

Encl.: Copy of pages of "Department of the Army U.S. Army Corps of Engineers";
Copy of pages of "Geology Glossary of the Design & Construction Standards".

CHAPTER 1
INTRODUCTION

1-1. Purpose and Scope. This manual presents guidelines for calculation of vertical displacements and settlement of soil under shallow foundations (mats and footings) supporting various types of structures and under embankments.

a. Causes of Soil Displacements. Soil is a nonhomogeneous porous material consisting of three phases: solids, fluid (normally water), and air. Soil deformation may occur by change in stress, water content, soil mass, or temperature. Vertical displacements and settlement caused by change in stress and water content are described in this manual. Limitations of these movements required for different structures are described in Chapter 2.

(1) Elastic deformation. Elastic or immediate deformation caused by static loads is usually small, and it occurs essentially at the same time these loads are applied to the soil. Guidance for tests and analyses to estimate immediate settlements of foundations, embankments, pavements, and other structures on cohesionless and cohesive soils for static loading conditions is given in Sections I and II of Chapter 3.

(2) Consolidation. Time delayed consolidation is the reduction in volume associated with a reduction in water content, and it occurs in all soils. Consolidation occurs quickly in coarse-grained soils such as sands and gravels, and it is usually not distinguishable from elastic deformation. Consolidation in fine-grained soils such as clays and organic materials can be significant and take considerable time to complete. Guidance for tests and analyses to estimate consolidation settlement of foundations, embankments, pavements, and other structures on cohesive soil for static loading conditions is given in Section III of Chapter 3.

(3) Secondary compression and creep. Secondary compression and creep are associated with the compression and distortion at constant water content of compressible soils such as clays, silts, organic materials, and peat. Guidance for tests and analyses to estimate secondary compression settlement is given in Section IV of Chapter 3.

(4) Dynamic forces. Dynamic loads cause settlement from rearrangement of particles, particularly in cohesionless soil, into more compact positions. Guidance to estimate settlement for some dynamic loads is given in Chapter 4.

(5) Expansive soil. Expansive soil contains colloidal clay minerals such as montmorillonite that experience heave and shrinkage with changes in the soil water content. Guidance for calculation of soil movements in expansive soil is given in Section I of Chapter 5.

(6) Collapsible soil. Collapsible soil usually consists of cohesive silty sands with a loose structure or large void ratio. The cohesion is usually caused by the chemical bonding of particles with soluble compounds such as calcareous or ferrous salts. Collapse occurs when the bonds between particles are dissolved. Guidance for calculation of settlement in collapsible soil is given in Section II of Chapter 5.

(3) Evaluation from overconsolidation ratio. The preconsolidation stress σ'_p may be evaluated from the overconsolidation ratio (OCR), σ'_p/σ'_{oz}, where σ'_{oz} is the effective vertical overburden pressure at depth z.

(a) The initial vertical effective pressure in a saturated soil mass before placement of an applied load from a structure is given by

$$\sigma'_{oz} = \gamma z - u_w \qquad (1\text{-}1)$$

where

σ'_{oz} = initial vertical effective stress at depth z, tsf
γ = saturated unit weight of soil mass at depth z, tsf
z = depth, ft
u_w = pore water pressure, tsf

u_w usually is the hydrostatic pressure $\gamma_w \cdot z_w$ where γ_w is the unit weight of water, 0.031 tsf, and z_w is the height of a column of water above depth z. γz is the total overburden pressure σ_{oz}.

(b) The overconsolidation ratio has been related empirically with the coefficient of earth pressure at rest K_o, $\sigma'_{hz}/\sigma'_{oz}$, and the plasticity index PI in Figure 3-21, TM 5-818-1. σ'_{hz} is the effective horizontal pressure at rest at depth z. Normally consolidated soil is defined as soil with OCR = 1. Overconsolidated soil is defined as soil with OCR > 1.

(c) The results of pressuremeter tests (PMT) may be used to evaluate the effective horizontal earth pressure σ'_{hz}. K_o may be evaluated if the effective vertical overburden pressure σ'_{oz} at depth z is known and the OCR estimated as above.

(4) Laboratory tests. The preconsolidation stress may be calculated from results of consolidation tests on undisturbed soil specimens, paragraph 3-12.

(a) A high preconsolidation stress may be anticipated if the natural water content is near the plastic limit PL or below or if $C_u/\sigma_{oz} > 0.3$ where C_u is the undrained shear strength (Table 3-2, TM 5-818-1).

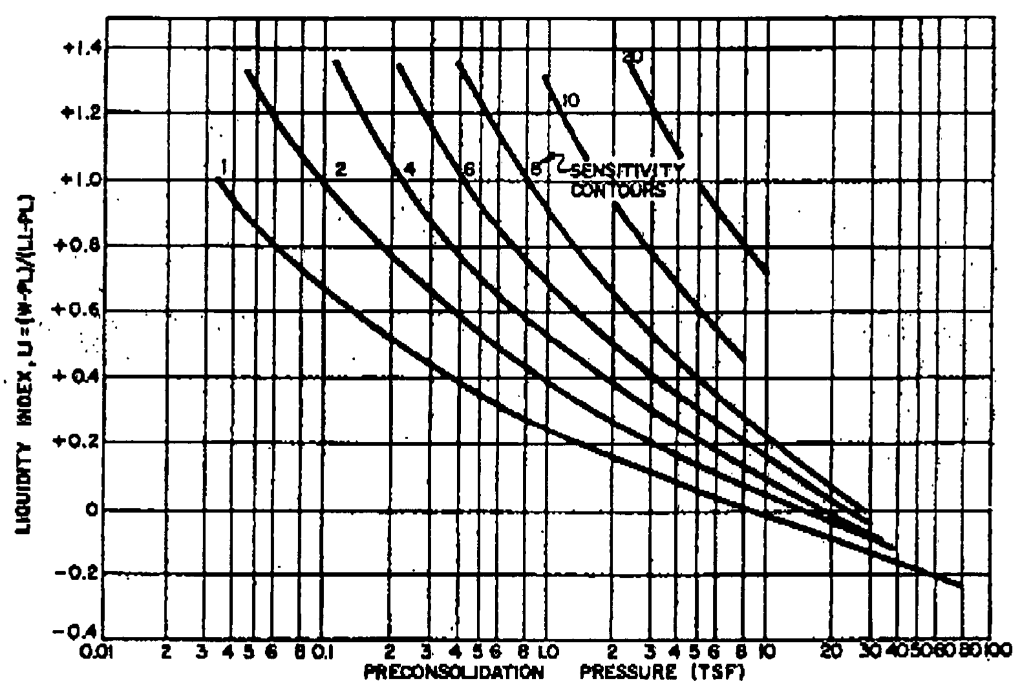
(b) An empirical relationship between the preconsolidation stress and liquidity index as a function of clay sensitivity, ratio of undisturbed to remolded undrained shear strength, is given in Figure 1-1. The preconsolidation stress may also be estimated from (NAVFAC DM-7.1)

$$\sigma'_p = \frac{C_u}{0.11 + 0.0037 PI} \qquad (1\text{-}2)$$

where

σ'_p = preconsolidation stress, tsf
C_u = undrained shear strength, tsf
PI = plasticity index, percent

b. <u>Pressure Bulb of Stressed Soil</u>. The pressure bulb is a common term that represents the volume of soil or zone below a foundation within which the



W - WATER CONTENT, PERCENT
PL = PLASTIC LIMIT, PERCENT
LL - LIQUID LIMIT, PERCENT

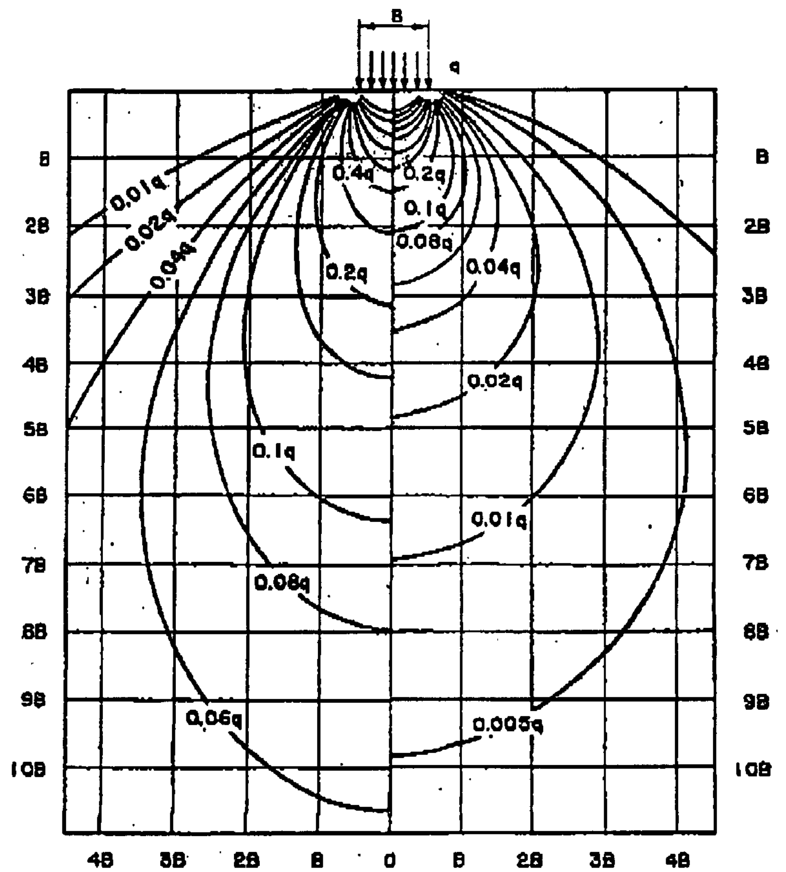
Figure 1-1. Preconsolidation Stress as a function of Liquidity Index LI and clay sensitivity (ratio of undisturbed to remolded shear strength) (After NAVFAC DM 7.1)

foundation load induces appreciable stress. The stress level at a particular point of soil beneath a foundation may be estimated by the theory of elasticity.

(1) Applicability of the theory of elasticity. Earth masses and foundation boundary conditions correspond approximately with the theory of plasticity (item 52).

(2) Stress distribution. Various laboratory, prototype, and full scale field tests of pressure cell measurements in response to applied surface loads on homogeneous soil show that the measured soil vertical stress distribution corresponds reasonably well to analytical models predicted by linear elastic analysis for similar boundary conditions.

(a) The Boussinesq method is commonly used to estimate the stress distribution in soil. This distribution indicates that the stressed zone decreases toward the edge of the foundation and becomes negligible (less than 10 percent of the stress intensity) at depths of about 6 times the width of an infinite strip or 2 times the width of a square foundation, Figure 1-2.



a. INFINITELY LONG   b. SQUARE

Figure 1-2. Contours of equal vertical stress beneath a foundation in a semi-infinite elastic solid by the Boussinesq solution

(b) The recommended depth of analysis is at least twice the least width of the footing or mat foundation, 4 times the width of infinite strips or embankments, or the depth of incompressible soil, whichever comes first.

(c) The distribution of vertical stress in material overlain by a much stiffer layer is more nearly determined by considering the entire mass as homogeneous rather than a layered elastic system.

(d) Methods and equations for estimating stresses in foundation soils required for analysis of settlement are provided in Appendix C, Stress Distribution in Soil.

APPENDIX B

GEOLOGY & SOILS GLOSSARY

ABSORBED WATER - Water held mechanically in a soil or rock mass and having physical properties not substantially different from ordinary water at the same temperature and pressure.

ADSORBED WATER - Water in a soil mass, held by physicochemical forces, having physical properties substantially different from absorbed or pore water due to altered molecular arrangement; or chemically combined water within clay minerals, at the same temperature and pressure.

AEOLIAN DEPOSITS - Wind-deposited material such as dune sands and loess deposits.

ALLUVIAL FAN - A cone-shaped deposit of alluvium (silt, sand, gravel) deposited by a stream where it runs out onto a level plain or meets a slower stream. The fans generally form where streams issue from mountains upon the lowland.

ALLUVIUM - Soil, the constituents of which have been transported by flowing water and subsequently deposited by sedimentation.

AQUIFER - A water-bearing formation that provides a ground water reservoir.

ANGLE OF INTERNAL FRICTION - Degrees - The angle whose tangent is the ratio between the resistance offered to sliding along a plane in the soil and the component of the applied force acting normal to that plane.

ANGLE OF REPOSE - Degrees - Angle between the horizontal and the maximum slope that a soil assumes through natural processes. For dry, granular soils, the effect of the height of slope is negligible;

FOSSILIFEROUS - Containing the remains or traces of animals or plants which have lived. (AGI)

FOUNDATION STRUCTURE OR STRUCTURE FOUNDATION - That part of a structure that transmits the load to the earth.

FOUNDATION SOIL - That part of the earth mass carrying the load of the structure or embankment (subgrade in highway and airport design terminology).

FRIABLE - Easily crumbled, as would be the case with rock that is poorly cemented. (AGI)

FROST ACTION - Freezing and thawing of moisture in materials and the resultant effects on these materials and on structures of which they are a part or with which they are in contact.

GEOLOGY - The science of the earth, which includes, in a large sense, all acquired or possible knowledge of the natural phenomena on and within the globe. Earth science including physical geology and geophysics; the history of the earth, stratigraphy and paleontology; mineralogy, petrology, and engineering, mining, and petroleum geology. (AGI) -- A science which treats the history of the earth and its life, esp., as recorded in the rocks. (Webster)

GLACIAL OUTWASH - Stratified sand and gravel removed from a glacier by meltwater streams and deposited in front of or beyond the terminal moraine or the margin of an active glacier.

GLACIAL TILL - Material deposited by glaciation, usually composed of a wide range of particle sizes (clay, silt, sand, gravel, cobbles and boulders). which has not been subjected to the sorting action of water. Similar to drift, morainal material or boulder clay.